# ORCSD Long Run Planning Committee

KINDERGARTEN AND FIRST GRADE PROJECTIONS

# Elements of the Model

Regression Analysis to predict Kindergarten and First Grade.

Grade Progression Ratios to predict all other grades.

Backcasting to see how well prior predictions matched actual enrollments.

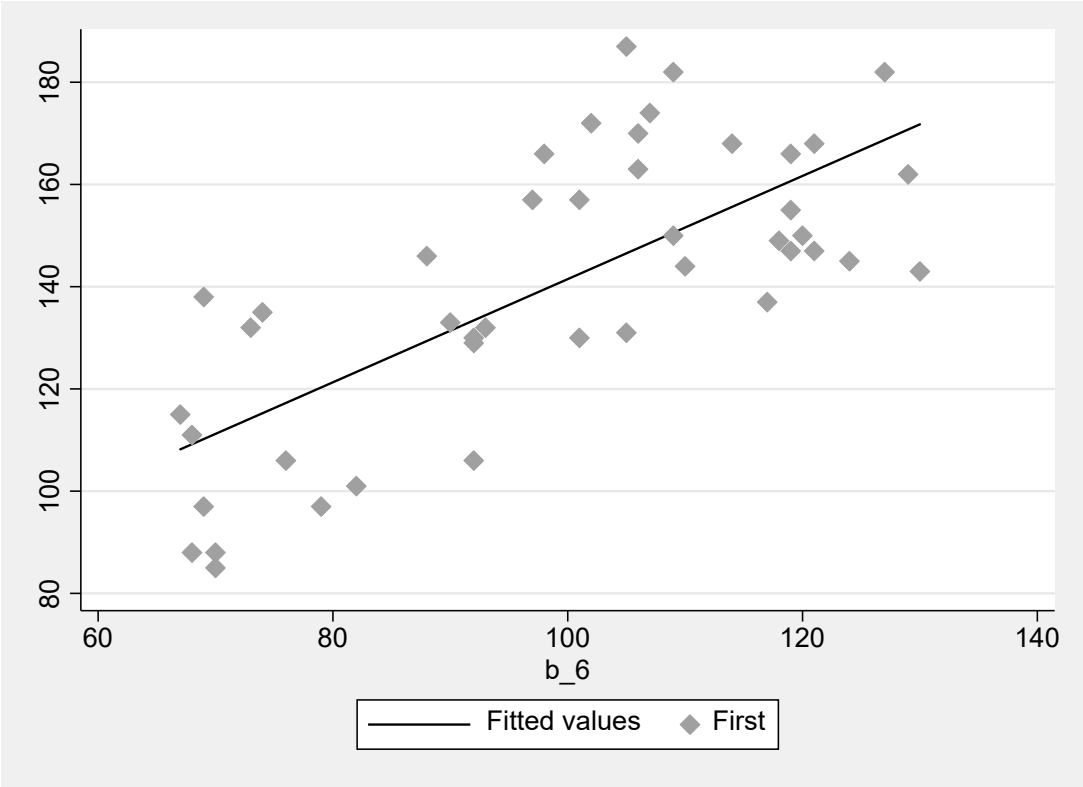
# Regression Analysis

A fancy way of fitting a trendline.

Easy to visualize when there is one explanatory variable (X-axis) and one dependent variable (y-axis)

- E.g. “First grade enrollments are predicted by births six years ago”

# Regression Analysis

# Advanced Regression Analysis

**Easy to generalize methodology to multiple explanatory variables.**

- E.g. “First grade enrollments are predicted by both births 5 years ago and by births six years ago”

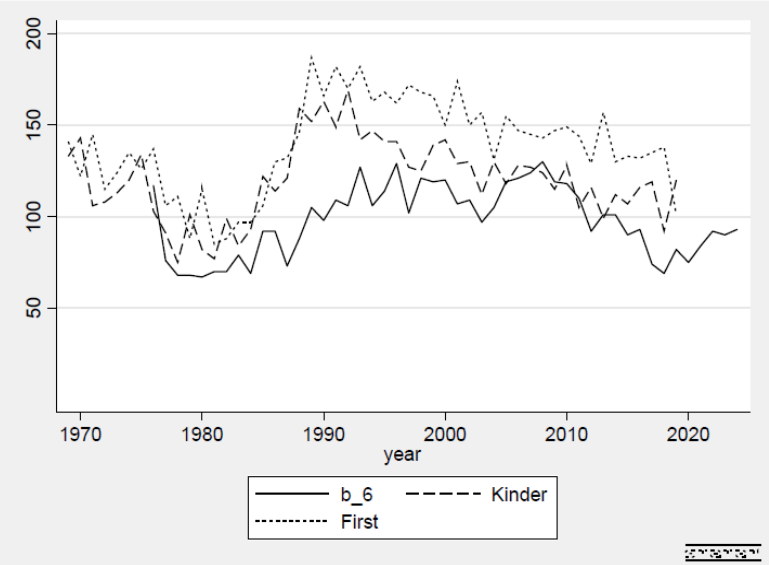
**Regression analysis works well when the correlation between variables is:**

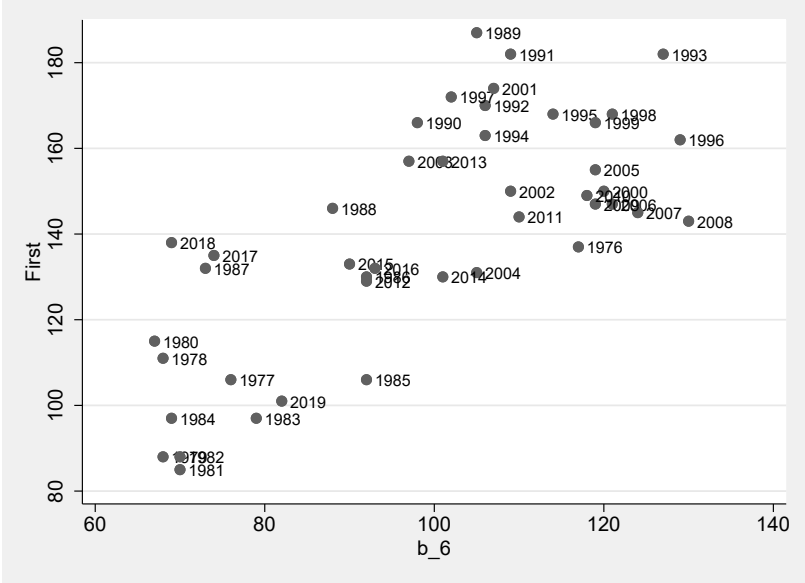
- Observed frequently or for a long period (many observations)
  - *Unclear if data on housing sales or local-level economic data has enough observations*
- Stable and consistent (no structural breaks)
  - *For this reason, we may not prefer this method for Kindergarten*

**Relatively simple to run**

- Can be added to excel

# Our Data




- Autocorrelation
  - This year's first grade is likely to be a good predictor of next year's cohort
- A consistent positive correlation to lagged births.
- Relationship is noisy and imprecise.
- Gradual downward trend since 1990

# Tradeoffs

**Lagged first-grade is highly correlated (last year's cohort size predicts this year's cohort), which has the potential to improving our predictions.**

- Limited value if we want to forecast out by more than one or two years.
- Covid homeschooling likely to create structural break
- Do we want to use Kindergarten as an explanatory variable?

**We currently run separate regressions for Kindergarten and First Grade.**

**Do we include or exclude years before 1990?**

**Births lagged 5-6 years is sensible as a predictor, but we need to forecast 10 years out.**

- Births born four years from now will be the first graders in 10 years.
- We use a second regression model to predict/forcast births.

```
reg First f_1 f_2 b_5 b_6 if year>1990, noco
```

| Source | SS | df | MS |
|---|---|---|---|
| Model | 667955.674 | 4 | 166988.919 |
| Residual | 3106.32555 | 25 | 124.253022 |
| Total | 671062 | 29 | 23140.069 |

| | | | |
|---|---|---|---|
| Number of obs | = | 29 | |
| F(4, 25) | = | 1343.94 | |
| Prob > F | = | 0.0000 | |
| R-squared | = | 0.9954 | |
| Adj R-squared | = | 0.9946 | |
| Root MSE | = | 11.147 | |

| First | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| f_1 | .1305317 | .1583547 | 0.82 | 0.418 | -.1956059 | .4566692 |
| f_2 | .6726104 | .1551759 | 4.33 | 0.000 | .3530196 | .9922012 |
| b_5 | .090786 | .1925847 | 0.47 | 0.641 | -.3058495 | .4874216 |
| b_6 | .1598833 | .194437 | 0.82 | 0.419 | -.2405673 | .5603339 |

# First Grade Regression Results and Projections

This year's first grade (predicted) = .13*last year's cohort + .67*year before last + .09*births five years ago + .16*births six years ago"

Next year's first grade = .13*this year's cohort + .67* last year + .09*births four years ago + .16*births five years ago"

T+2 first grade = .13*next year's forecast + .67* this year + .09*births three years ago + .16*births four years ago"

```
. reg Kind k_1 k_2 b_4 b_5 post if year>1990, noco
```

| Source | SS | df | MS |
|---|---|---|---|
| Model | 464224.664 | 5 | 92844.9327 |
| Residual | 2474.33637 | 24 | 103.097349 |
| Total | 466699 | 29 | 16093.069 |

| | | | |
|---|---|---|---|
| Number of obs | = | 29 | |
| F(5, 24) | = | 900.56 | |
| Prob > F | = | 0.0000 | |
| R-squared | = | 0.9947 | |
| Adj R-squared | = | 0.9936 | |
| Root MSE | = | 10.154 | |

| Kinder | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| k_1 | .1602848 | .1514973 | 1.06 | 0.301 | -.1523902 | .4729598 |
| k_2 | .7012573 | .1667775 | 4.20 | 0.000 | .3570455 | 1.045469 |
| b_4 | -.1129424 | .1888299 | -0.60 | 0.555 | -.5026681 | .2767833 |
| b_5 | .243847 | .1650111 | 1.48 | 0.152 | -.0967192 | .5844132 |
| post_2010 | 1.706064 | 3.954899 | 0.43 | 0.670 | -6.456445 | 9.868574 |

# Kindergarten Regression Results and Projections

This year's Kindergarte (predicted) = .16*last year's cohort + .70*year before last – .11*births four years ago + .24*births five years ago + 1.7

```
. reg birth b_1 b_2 trend if year>1990, noco
```

| Source | SS | df | MS |
|---|---|---|---|
| Model | 306432.272 | 3 | 102144.091 |
| Residual | 2670.72799 | 26 | 102.720307 |
| Total | 309103 | 29 | 10658.7241 |

| | | | |
|---|---|---|---|
| Number of obs | = | | 29 |
| F(3, 26) | = | | 994.39 |
| Prob > F | = | | 0.0000 |
| R-squared | = | | 0.9914 |
| Adj R-squared | = | | 0.9904 |
| Root MSE | = | | 10.135 |

| births | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| b_1 | .6214716 | .1755694 | 3.54 | 0.002 | .2605836 | .9823596 |
| b_2 | .3163914 | .1747374 | 1.81 | 0.082 | -.0427866 | .6755693 |
| trend | .1520566 | .1491892 | 1.02 | 0.317 | -.1546062 | .4587193 |

**Birth Projections**

Trend = 1 in 1991, Trend = 2 in 1992, etc.

**Predicted Births in 2020**

= .6*2018_births +.3*2019_birth+ .15 * 30 (trend=30 in 2020)